No. of Printed Pages : 3

**BAS-008**

# B.TECH. (AEROSPACE ENGINEERING) (BTAE)

## Term-End Examination

## June, 2014

## BAS-008 : STRENGTH OF MATERIALS

*Time : 3 Hours* *Maximum Marks : 70*

***Note :*** *(i)* *Answer **any five** questions.*

*(ii)* *All questions carry **equal** marks.*

*(iii)* *Use of (Non - Programmable, scientific calculator) calculator is **permitted**. Assume any missing data if required.*

**1.** Calculate the modulus of rigidity and bulk modulus of a cylindrical bar of diameter 30 mm and length 1.5 m, if the longitudinal strain in bar during a tensile stress is four times the lateral strain. Find change in volume, when bar is subjected to a hydrostatic pressure of 100 $N/mm^2$. Take $E = 1x10^5$ $N/mm^2$. **14**

**2.** At a point in a strained material, the principle stresses are 100 $N/mm^2$ tensile and 40 $N/mm^2$ compressive. Determine the resultant stress in magnitude and direction on a plane inclined at 60° to the axis of the major principle stress. What is the maximum intensity of shear stress in the material at the point on the plane ? **14**

3. A bolt is acted upon by an axial pull of 16 kN along with a transverse shear force of 10 kN. Determine the diameter of the bolt required according to following theories of failure : 14

(a) Maximum shear stress theory
(b) Maximum principle strain theory
(c) Maximum strain energy theory
(d) Maximum shear strain energy theory
(e) Maximum principle stress theory

Take Elastic limit of bolt to be 250 MPa, Factor of safety as 2.5 and poisson's ratio is 0.3.

4. A beam 10 m long and simply supported at each end, has a uniformly distributed load of 1000 N/m, extending from left end upto the centre of beam. There is also an anticlock wise couple of 15 kNm at a distance of 2.5 m from the right end (as shown in fig 1) Draw S.F(shear force) and Bending moment diagrams. 14

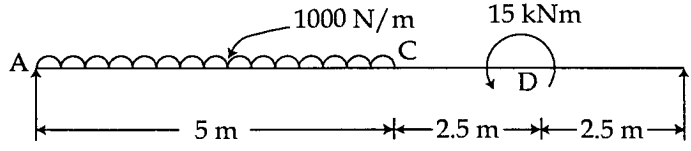


Fig. 1

5. (a) A timber beam of rectangular section is to support a load of 20 kN/m uniformly distributed over a span of 3.6 m when beam is simply supported. If depth of section is to be twice the breadth, and the stress in timber is not to exceed 7 $N/mm^2$, find dimension of the cross section for the beam. 7

(b) How would you modify the cross section of beam in 5(a), if it carries a concentrated load of 20 kN placed at centre with the same ratio of breadth to depth ? 7

6. Using the castigliano's theorem, determine deflection and the slope at the free end of a cantilever with uniformly distributed load on the whole span. **14**

7. Establish relationship to find the shear stress across
   (a) An I - Section **7**
   (b) A circular Section **7**
   What is the maximum value in each case ?

8. (a) Deduce the relation for stress in case of shock load. **4**
   (b) A 1 meter long bar of rectangular cross - section 50 mm x 80 mm is subjected to an axial load of 1.2 kN. Determine the maximum stress and strain energy developed in bar if the load is applied : **10**
      (i) Gradually
      (ii) Suddenly
      (iii) Falls through a height of 25 mm. (E = 205 Gpa)